LIVINGSTON RAIL YARD
AMBIENT AIR MONITORING REPORT

THIRD QUARTER 1992
and
OCTOBER 1991 THROUGH SEPTEMBER 1992
ONE-YEAR SUMMARY

ENVIROCON, INC.

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and
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Submitted to:

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and Environmental Sciences
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Submitted by:

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Submittal date:

January 12, 1993

ENVIROCON, INC.

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1.0 INTRODUCTION

This document presents the results of Burlington Northern Railroad's (BNRR's) ambient air monitoring investigations conducted by Envirocon, Inc. during the third quarter of 1992 for the Livingston Rail Yard project, in Livingston, Montana. The year between October 1991 and September 1992 is also summarized. The purpose of ambient air monitoring is to assess the impact of existing site contamination and remedial activities on ambient air quality.

Ambient air monitoring data collection began on November 10, 1990. This quarterly report represents the period between July 1 and September 30, 1992. Measured parameters, defined by Section 14.4 of the Interim Remedial Measures Work Plan (IRMWP) (Envirocon, 1989), originally included PM10, total suspended particulate (TSP), metals, polynuclear aromatic hydrocarbons (PAH), and meteorology. In June of 1991, with MDHES' approval, the measured parameters were reduced to include only PM10 and meteorology. The TSP, metal, and PAH results were discussed in the first Ambient Air Monitoring Report (Envirocon, 1990). All results have been presented in quarterly air monitoring reports, and all results through May 31, 1992 are presented in the Final Draft Remedial Investigation Report (Envirocon, 1992).

The design and operation of the ambient air monitoring program are in accordance with the IRMWP, as amended. Envirocon is responsible for the equipment's daily operations. Bison Engineering, Inc. provides assistance by conducting audits, performing the laboratory work, and assisting with quarterly-report data preparation.

2.0 NETWORK CONFIGURATION

2.1 Monitoring Locations - General

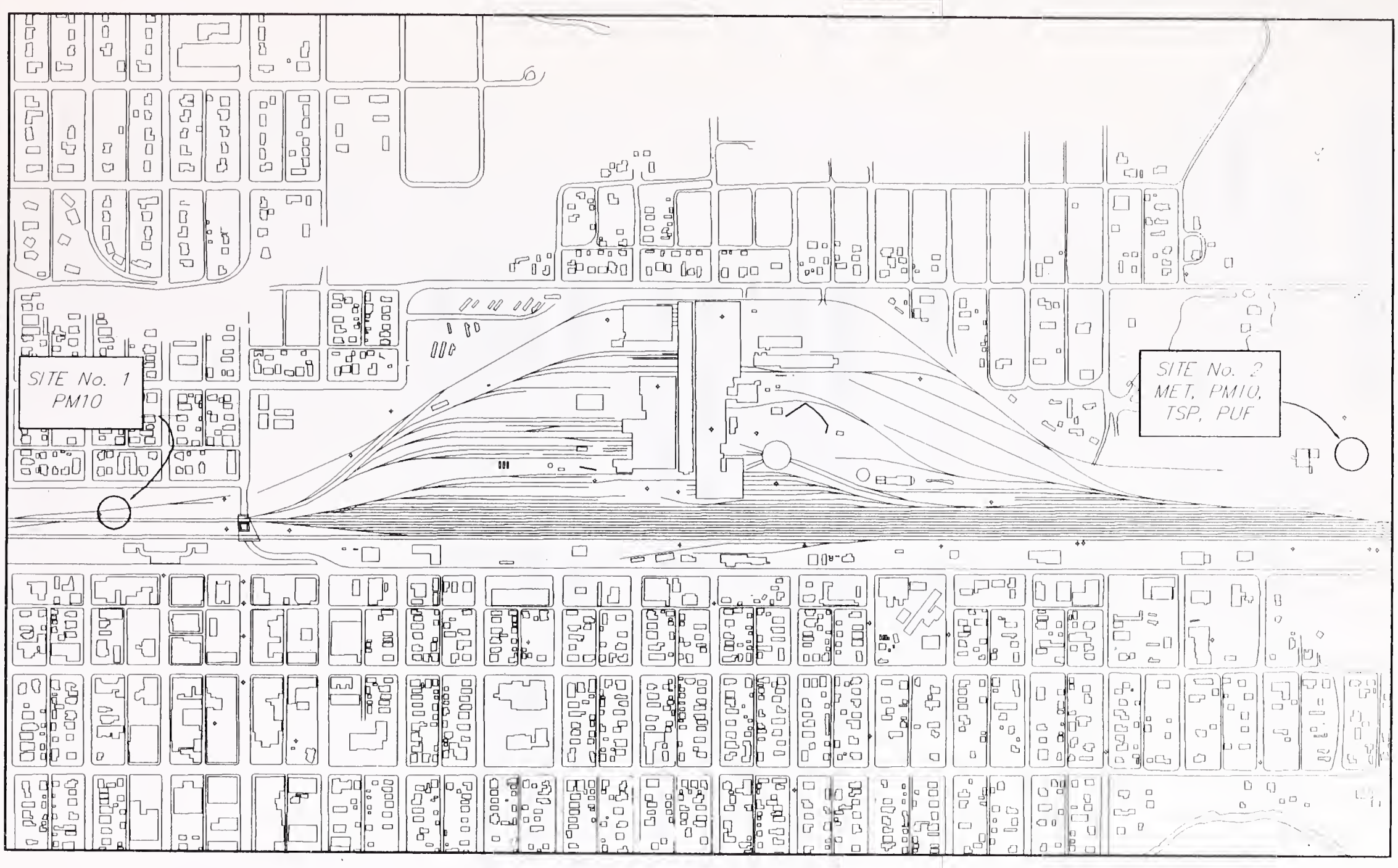
The ambient air monitoring network consists of an upwind station and a downwind station. Each station contains a PM10 air monitoring instrument. The downwind station also contains meteorological equipment.

The upwind station measures ambient air quality upwind of all remedial activities. The downwind station is located to measure worst-case ambient air impacted by remediation activities. In addition, ambient air at the downwind station is impacted by current rail yard operations and the emissions of the Park County incinerator. Figure 1.0 shows the locations of both stations. The coordinate locations of these sites are shown on Table 1.0.

Table 1.0
Ambient Monitoring Locations

Station	UTM East	UTM North	North Latitude	West Longitude
Upwind	334050	5056410	45° 38' 36"	110° 33' 26"
Downwind	335360	5057520	45° 39' 13"	110° 32' 47"

UTM ZONE = 12



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BURLINGTON NORTHERN

AMBIENT AIR
MONITORING REPORT

UPWIND & DOWNWIND AMBIENT
AIR MONITORING LOCATION

ENVIROCON, INC.

140101

FIGURE 1.1

AutoCAD FILE: DM1.DWG

2.2 Monitoring Parameters

The ambient air monitoring system is designed to measure PM10. The following is a list of the parameters measured and the methodology used for analysis during the third quarter of 1992:

- PM10 - PM10 is particulate matter with an aerodynamic diameter less than 10 microns. Both the upwind and downwind stations have PM10 samplers.

  Method: 40 CFR Part 50, Appendix J.

- Meteorology - A meteorological tower was constructed at the downwind site in order to assess what meteorological events may lead to the increase or decrease of ambient air pollutants. The station recorded wind speed, wind direction, temperature, and wind sigma (standard deviation of the wind direction).

  Method: Anemometer cup, wind vane, thermocouple, and computer data acquisition system (Ambient Monitoring Guidelines for Prevention of Significant Deterioration [PSD], Section 6, EPA, EPA-450/4-87-007).

2.3 Monitoring Frequency

The monitoring frequency for each parameter is shown on Table 2.0.

Table 2.0

Ambient Monitoring Frequency

PM10	One-day-in-six, 24-hour sample Upwind and downwind stations
Meteorology	Continuous sampling Hourly data analysis Downwind station only

3.0 DATA SUMMARY: THIRD QUARTER 1992

3.1 PM10

PM10 monitoring began during the fourth quarter of 1990. This report includes PM10 and meteorological data for the third quarter of 1992. Between July 1 and September 30, 1992, 14 PM10 samples, out of a possible total of 15 samples, were collected at the upwind station, and 12 PM10 samples were collected at the downwind station. PM10 data recovery for this period was 93% at the upwind site and 80% at the downwind site.

The mean PM10 values for the third quarter were 19 ug/m^3 at the upwind site and 17 ug/m^3 at the downwind site. The peak PM10 reporting values for the upwind and downwind sites were 32 and 36 ug/m^3, respectively. These values are compared against the Montana ambient air quality standards on Table 3.0.

Table 3.0

Third Quarter 1992 PM10 Results vs. Ambient Standards

Units: ug/m^3

	Standard	Upwind Station	Downwind Station
Arithmetic Mean	50*	19	17
Peak	150**	32	36

* Annual mean
** Not to be exceeded more than once per year.

Third quarter 1992 complete PM10 data and summary statistics are provided in Appendix A. The statistics include monthly means, yearly means to-date, and standard deviations. Appendix B contains the results of third-quarter 1992 calibrations and audits.

3.2 Meteorology

The meteorological station measures wind speed, wind direction, and temperature. The meteorological system was hit by lightning on July 4 and was seriously damaged. The system was repaired and operational again after September 16, except for the wind-speed sensor. The wind-speed sensor was not repaired until after the third quarter had ended. As a result, wind-speed data are discussed for a single 4-day period in July and wind direction and temperature are discussed for both the 4-day period in July and the second half of September 1992. Meteorological data recovery during the third quarter of 1992 was 4% for wind speed and 21% for temperature and wind direction.

Between July 1 and July 4, 1992, the average wind speed was 6.8 miles per hour, the resultant wind direction was 153 degrees, and the percentage of calm hours was 0.0%. The maximum temperature during this period was 71.6° Fahrenheit (F), the minimum temperature was 44.2° F, and the average temperature was 55° F.

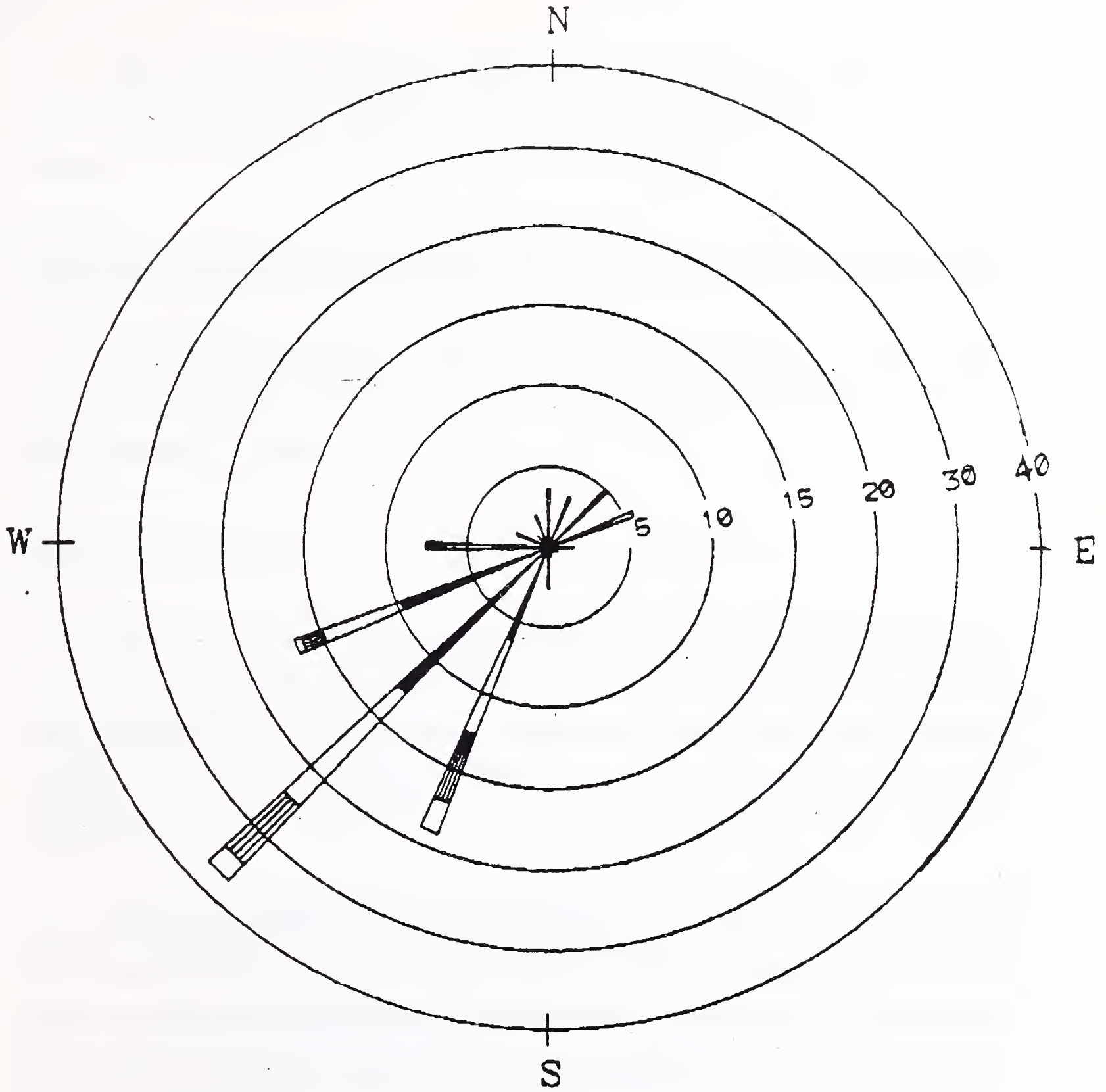
Between September 16 and September 30, 1992, the resultant wind direction was 218 degrees. The maximum temperature during this period was 86.9° F, the minimum temperature was 27.5° F, and the average temperature was 46.6° F.

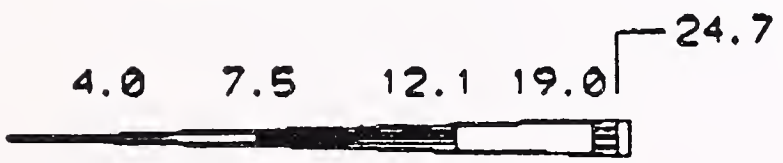
For the fourth quarter of 1991 and the first two quarters of 1992, a complete listing of the meteorological information for wind speed, wind direction, wind sigma, and temperature, along with monthly and seasonal (to-date) wind-frequency distribution data and wind roses, were presented in their respective quarterly ambient air monitoring reports. A wind rose for October 1991 through September 1992 is shown on Figure 2.0 of this report.

Third quarter 1992 meteorological information for wind speed, wind direction, wind sigma, and temperature are presented in Appendix A.

4.0 DATA ANALYSIS: THIRD QUARTER 1992

Section 3.1 of this report provided a comparison between the PM10 sample results and the Montana and national ambient air quality standards (NAAQS). Data gathered during the third quarter does not indicate any threat of an exceedance of these standards.





WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE - WIND IS BLOWING FROM THE NORTH 3.6 PERCENT OF THE TIME.

WINDROSE

STATION NO. 2
Livingston, MT
PERIOD:

OCTOBER 1991
through
SEPTEMBER 1992

Bowman
Environmental
Engineering

Data gathered during the third quarter of 1992 is analyzed together with the previous three quarters. This analysis is found in Section 5.2 of this report.

5.0 ONE-YEAR SUMMARY: OCTOBER 1991 THROUGH SEPTEMBER 1992

This section presents a summary of all PM10 and meteorological data collected during the year comprising the fourth quarter of 1991 and the first three quarters of 1992.

5.1 PM10 Data Summary

Between October 1, 1991 and September 30, 1992, 55 PM10 samples, out of a possible total of 60 samples, were collected at the upwind station, and 52 PM10 samples were collected at the downwind station. PM10 data recovery completeness for this period was 92% at the upwind site and 87% at the downwind site.

The mean PM10 values for this period were 18 ug/m^3 at the upwind site and 17 ug/m^3 at the downwind site. The peak PM10 reporting values for the upwind and downwind sites were 36 and 39 ug/m^3, respectively. These values are compared against the Montana ambient air quality standards on Table 4.0.

Table 4.0

October 1991 through September 1992
PM10 Results vs. Ambient Standards

Units: ug/m^3

	Standard	Upwind Station	Downwind Station
Arithmetic Mean	50*	18	17
Peak	150**	36	39

* Annual mean
** Not to be exceeded more than once per year.

The results indicate values well below these standards. All information collected to-date indicates that the standards will not be exceeded.

Complete PM10 data, summary statistics, and results of calibrations and audits for the fourth quarter of 1991 and the first two quarters of 1992 were presented in their respective quarterly ambient air monitoring reports. Third quarter 1992 and October 1991 through September 1992 PM10 data and summary statistics are presented in Appendix A of this report, and the results of calibrations and audits are presented in Appendix B.

Graphical representations of the PM10 monitoring data are presented on Figures 3.0 and 4.0. The figures show monthly and seasonal trends within the particulate data distribution for both the upwind and downwind sites.

5.2 Data Analysis

The purpose of the ambient air monitoring network is to assess the impacts of existing site contamination and remedial activities on ambient air quality. However, the ambient air monitoring network cannot distinguish

Figure 3.0

MEAN & MAXIMUM UPWIND PM10 CONCENTRATIONS

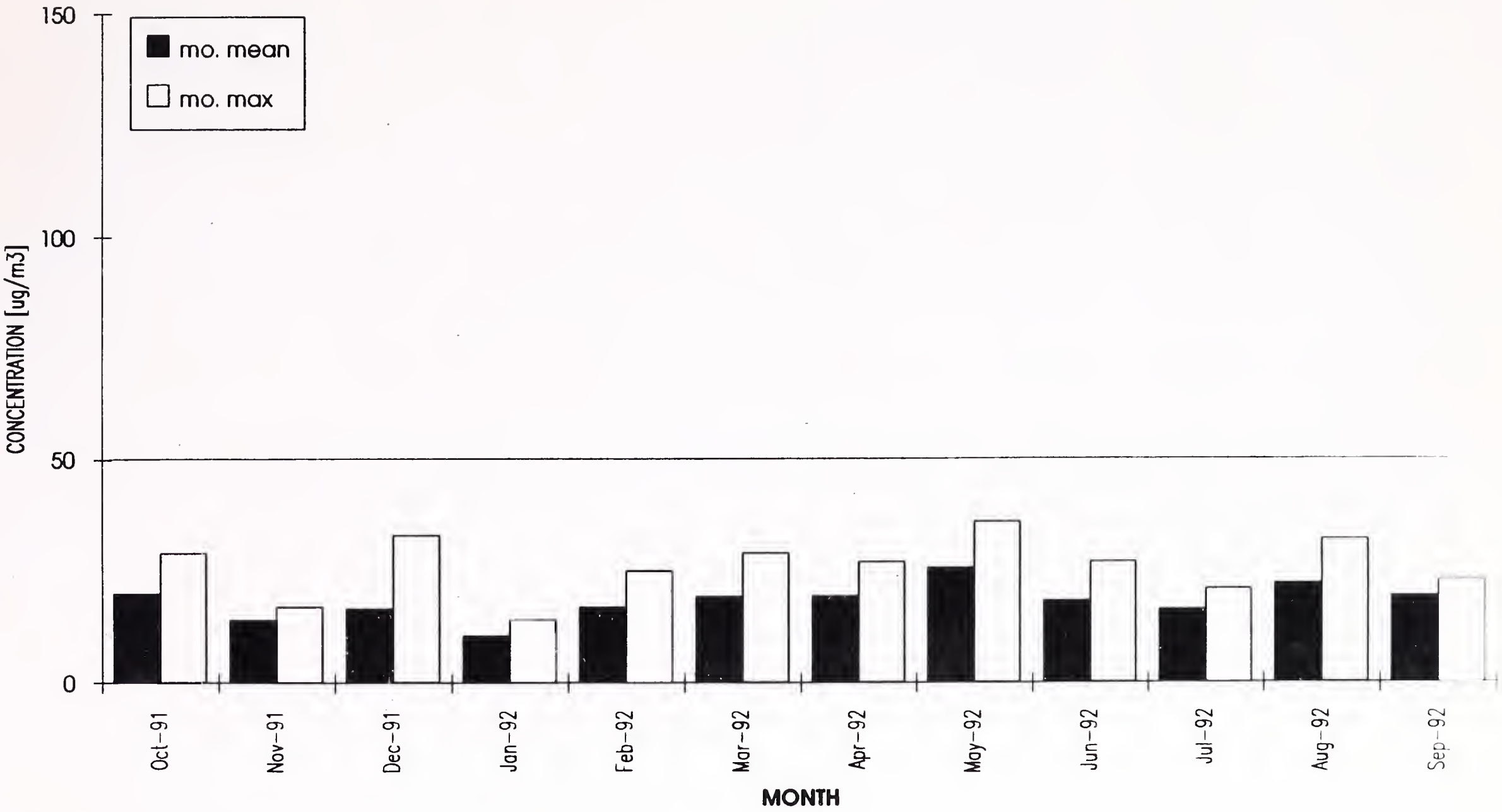
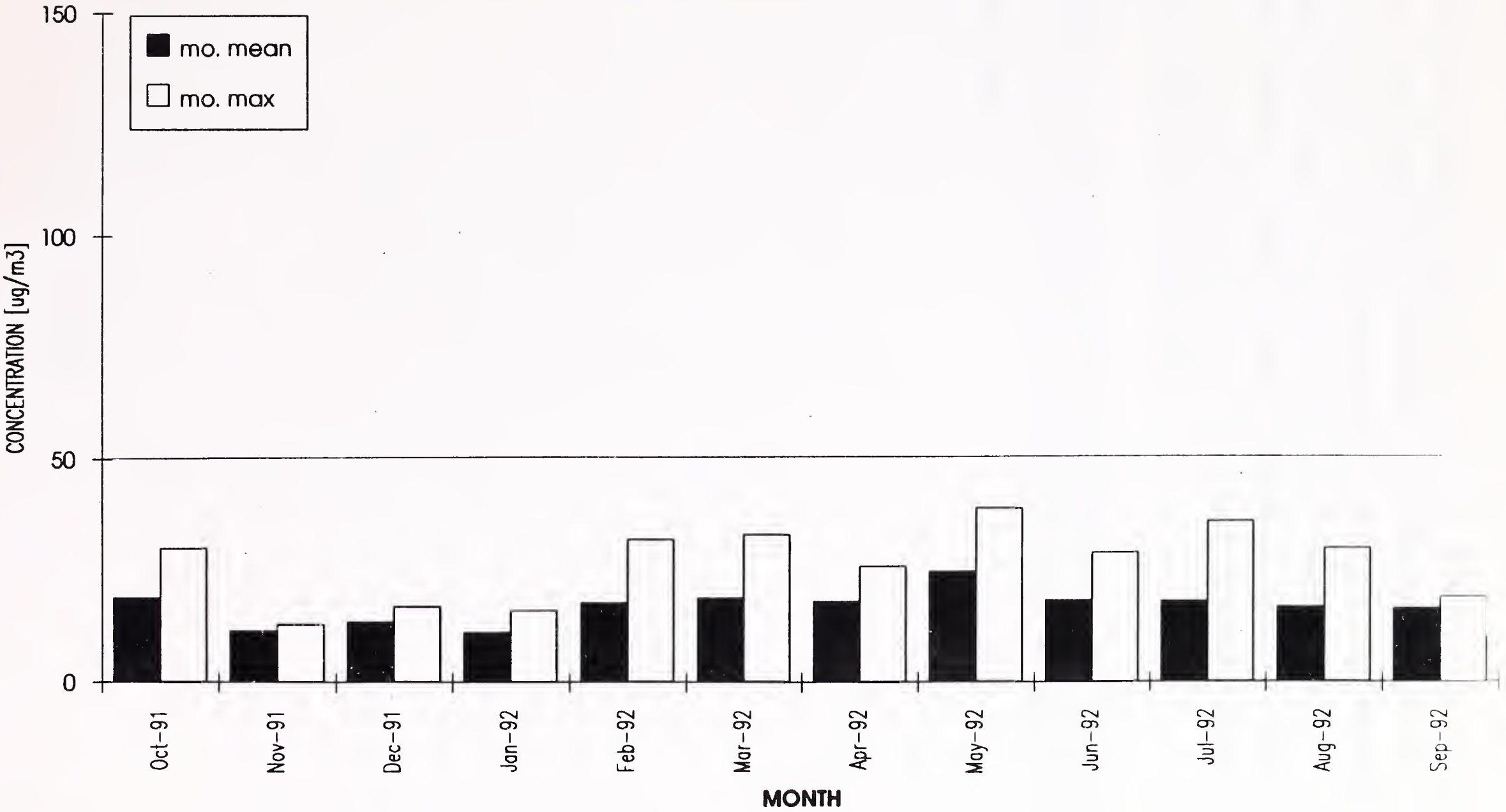


Figure 4.0

MEAN & MAXIMUM DOWNWIND PM10 CONCENTRATIONS



between sources associated with previous site contamination, current railyard operations, or the Park County incinerator. The first assessment step is to measure parameters which could be reasonably expected to enter the ambient atmosphere. The second assessment step is to compare these results with established ambient air quality standards. The final assessment step is to compare the downwind results with background (upwind) results. The following is a discussion of PM10 results.

Envirocon compared the October 1991 through September 1992 upwind and downwind PM10 data statistically. The data used in this investigation are provided on Table 5.0.

Table 5.0

Upwind/Downwind PM10 Comparison

units: ug/m^3

Date	Upwind	Downwind	Difference
6-Oct-91	15	14	1
12-Oct-91	26	30	-4
19-Oct-91	14	14	0
24-Oct-91	16	14	2
30-Oct-91	29	23	6
6-Nov-91	17	13	4
11-Nov-91	16	N/A	N/A
17-Nov-91	9	12	-3
23-Nov-91	N/A	10	N/A
29-Nov-91	N/A	11	N/A
4-Dec-91	9	N/A	N/A
10-Dec-91	16	14	2
16-Dec-91	33	17	16
22-Dec-91	12	10	2
29-Dec-91	13	13	0
4-Jan-92	10	10	0
13-Jan-92	5	16	-11
19-Jan-92	10	7	3
25-Jan-92	13	14	3
31-Jan-92	14	12	2
6-Feb-92	25	32	-7
12-Feb-92	15	15	0
18-Feb-92	11	10	1

Table 5.0 (cont.)

Date	Upwind	Downwind	Difference
24-Feb-92	N/A	14	N/A
1-Mar-92	13	14	-1
7-Mar-92	14	11	3
13-Mar-92	29	24	5
19-Mar-92	13	14	-1
25-Mar-92	26	33	-3
31-Mar-92	21	17	4
6-Apr-92	18	16	2
12-Apr-92	20	16	4
18-Apr-92	13	13	0
24-Apr-92	N/A	20	N/A
30-Apr-92	27	26	1
6-May-92	33	33	-6
12-May-92	36		36
18-May-92	23	23	0
24-May-92	21	18	3
30-May-92	16	19	-3
5-Jun-92	16	14	2
11-Jun-92	23	N/A	N/A
17-Jun-92	9	N/A	N/A
23-Jun-92	27	29	-2
29-Jun-92	17	12	5
5-Jul-92	14	13	1
11-Jul-92	14	15	-1

Table 5.0 (cont.)

Date	Upwind	Downwind	Difference
17-Jul-92	17	13	4
23-Jul-92	16	14	2
29-Jul-92	21	36	-15
4-Aug-92	32	30	2
10-Aug-92	30	25	5
16-Aug-92	17	17	4
22-Aug-92	17	9	1
28-Aug-92	22	3	19
9-Sep-92	22	N/A	N/A
9-Sep-92	N/A	N/A	N/A
16-Sep-92	17	19	-2
21-Sep-92	23	N/A	N/A
27-Sep-92	16	14	2

Two statistical tests (paired-difference and unpaired t-tests) were applied to the data. The tests were designed to assess whether or not there is enough evidence to reject the null hypothesis that the two means are the same. Statistics used to calculate t-test values are summarized on Table 6.0.

Table 6.0

Summary Statistics

UPWIND	Mean [ug/m^3] : Std Dev: [ug/m^3] : No. of Samples :	18.45 7.14 55
DOWNWIND	Mean [ug/m^3] : Std Dev: [ug/m^3] : No. of Samples :	17.08 7.68 52
DIFFERENCE	Mean [ug/m^3] : Std Dev: [ug/m^3] : No. of Samples :	1.63 7.30 49

Comparison of Upwind and Downwind Means

Paired-Difference t-test:

t = Mean/(S/(n^.5)) where S = std. dev.
t = 1.57
Critical t (95%) = +/- 1.96

Unpaired t-test:

t = (mean1 - mean2)/(S*((1/n_1+1/n_2)^.5)) where S = pooled std. dev.
t = 0.96
Critical t (95%) = +/- 1.96

The t value for both the paired-difference and unpaired t-tests falls within its respective 95% two-tailed confidence interval, as defined by the critical t value. It is concluded that not enough evidence is present to reject

the null hypothesis. Therefore, it appears that there is no difference in the mean PM10 values for the upwind and downwind monitoring sites.

5.3 Data Quality

All sampling and analysis were conducted in accordance with EPA and Montana quality-assurance procedures. The PM10 data were corrected to reference conditions (760 mm Hg. - 25° C), as required.

PM10 sampling instruments were audited quarterly and meteorological instruments were audited semiannually. The results of the audits are presented in the quarterly reports. All audits followed schedules outlined in Addendum 14-4 to the IRMWP and were conducted in accordance with EPA and Montana quality-assurance procedures. A PM10 audit was not performed during the fourth quarter of 1991.

PM10 precision data for October 1991 through September 1992 is presented in Appendix B of this report.

5.4 Data Recovery

Data recovery information for the entire reporting year is summarized below. Data recovery compares the actual number of samples obtained to the number of theoretical samples available. No significant problems were noted with PM10 sample collection and analysis during the year. The meteorological system was seriously damaged by lightning in the third quarter of 1992, reducing the data recovery.

PM10 data recovery for the reporting year was 92% at the upwind site and 87% at the downwind site. Meteorological data recovery for the reporting year was 78.5% for temperature and wind direction and 74% for wind speed. PM10 data recoveries for each month are presented on Tables 7.0 and 8.0.

5.5 Summary

PM10 data have been collected upwind and downwind of the Livingston Rail Yard for 20 consecutive months. Overall data recovery for the period between October 1991 and September 1992 was 89% at both sites.

Comparison of ambient PM10 concentrations upwind and downwind of the Livingston Rail Yard has shown that activities at the site have not led to increases in respirable particulates downwind of the site. In fact, the average concentrations over the entire 20 months of data collection have shown that upwind concentrations are, on average, greater than downwind concentrations.

Of the 107 PM10 samples collected upwind and downwind of the site during the reporting year, none has exceeded 30% of the peak ambient standard or 40% of the annual mean.

Table 7.0

PM10 DATA RECOVERY

LRY, Livingston, Mt.

October 1991 - September 1992

UPWIND : Site 1

Sampling Period	Total Periods	Total Measurements	Percentage Recovered
Oct-91	5	5	100%
Nov-91	5	3	60%
Dec-91	5	5	100%
Fourth Quarter 1991	15	13	**87%**
Jan-92	5	5	100%
Feb-92	4	3	75%
Mar-92	6	6	100%
First Quarter 1992	15	14	**93%**
Apr-92	5	4	80%
May-92	5	5	100%
Jun-92	5	5	100%
Second Quarter 1992	15	14	**93%**
Jul-92	5	5	100%
Aug-92	5	5	100%
Sep-92	5	4	80%
Third Quarter 1992	15	14	**93%**
REPORTING YEAR	60	55	**92%**

Table 8.0

PM10 DATA RECOVERY

LRY, Livingston, Mt.

October 1991 - September 1992

DOWNWIND : Site 2

Sampling Period	Total Periods	Total Measurements	Percentage Recovered
Oct-91	5	5	100%
Nov-91	5	4	80%
Dec-91	5	4	80%
Fourth Quarter 1991	15	13	**87%**
Jan-92	5	5	100%
Feb-92	4	4	100%
Mar-92	6	6	100%
First Quarter 1992	15	15	**100%**
Apr-92	5	5	100%
May-92	5	4	80%
Jun-92	5	3	60%
Second Quarter 1992	15	12	**80%**
Jul-92	5	5	100%
Aug-92	5	5	100%
Sep-92	5	2	40%
Third Quarter 1992	15	12	**80%**
REPORTING YEAR	60	52	**87%**

APPENDIX A

DATA

Bison Engineering Inc

Helena, MT 59601

PM10 Particulate Summary

1991 Site & Area: 1111 3

Upwind Site Livingston, MT Envirocon

(Values are in Micrograms per Cubic Meter)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	19	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	9
5	-	15	-	-	-	-	18	-	-	-	-	-
6	-	-	-	12	18	19	-	-	-	15	17	-
7	-	-	12	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	16
11	-	19	-	-	-	28	-	-	-	-	16	-
12	14	-	-	13	12	-	-	-	-	26	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	39	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	33
17	-	9	-	-	-	12	-	-	-	-	9	-
18	13	-	-	10	13	-	-	-	-	-	-	-
19	-	-	40	-	-	-	-	-	-	14	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	12
23	-	15	-	-	-	-	-	-	-	-	-	-
24	15	-	-	19	22	21	-	-	56	16	-	-
25	-	-	13	-	-	-	24	21	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	13
30	22	-	-	22	16	10	-	-	19	29	-	-
31	-	-	16	-	-	-	-	-	-	-	-	-
No.	4	4	6	5	5	5	2	1	2	5	3	5
Max	22	19	40	22	22	28	24	21	56	29	17	33
Avg	16	15	23	15	16	18	21	21	38	20	14	17

Bison Engineering Inc.

UPWIND

Helena, Montana

1992 PM10 Particulate Summary

Envirocon, Site #1 Livingston, MT

(Values are in Micrograms per Cubic Meter)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	13	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	22	-	-	-
4	11	-	-	-	-	-	-	32	-	-	-	-
5	-	-	-	-	-	16	14	-	-	-	-	-
6	-	25	-	18	33	-	-	-	-	-	-	-
7	-	-	14	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	30	-	-	-	-
11	-	-	-	-	-	23	14	-	-	-	-	-
12	-	15	-	20	36	-	-	-	-	-	-	-
13	5	-	29	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
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29	-	-	-	-	-	17	21	-	-	-	-	-
30	-	-	-	27	16	-	-	-	-	-	-	-
31	14	-	21	-	-	-	-	-	-	-	-	-
No.	5	3	6	4	5	5	5	5	4	0	0	0
Max	14	25	29	27	36	27	21	32	23	0	0	0
Avg	11	17	19	20	26	18	16	22	20	0	0	0

Min: 5 Max: 36 2nd Max: 32 # > 150: 0 Total Obs: 42

Arithmetic Mean: 19 Standard Deviation: 7

Bison Engineering Inc

Helena, MT 59601

PM10 Particulate Summary

1991 Site & Area: 1111 4

Downwind Site Livingston, MT Envirocon

(Values are in Micrograms per Cubic Meter)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	8	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-
5	-	12	-	-	-	-	22	-	-	-	-	-
6	17	-	-	11	16	-	-	-	-	14	13	-
7	-	-	15	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	14
11	-	18	-	-	-	34	-	-	-	-	-	-
12	-	-	-	6	6	-	-	-	-	30	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	28	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	17
17	-	14	-	-	-	19	-	-	-	-	12	-
18	13	-	-	5	11	-	-	-	-	-	-	-
19	-	-	20	-	-	-	-	-	-	14	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	10
23	-	13	-	-	-	-	-	-	-	-	10	-
24	9	-	-	19	15	18	-	-	-	14	-	-
25	-	-	8	-	-	-	28	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	11	13
30	24	-	-	22	-	18	-	-	22	23	-	-
31	-	-	15	-	-	-	-	-	-	-	-	-
No.	4	4	6	5	4	4	2	0	1	5	4	4
Max	24	18	28	22	16	34	28		22	30	13	17
Avg	16	14	16	13	12	22	25		22	19	12	14

Bison Engineering Inc.

Helena, Montana

DOWNWIND

1992 PM10 Particulate Summary

Envirocon, Site #2 Livingston, MT

(Values are in Micrograms per Cubic Meter)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	14	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-
4	11	-	-	-	-	-	-	30	-	-	-	-
5	-	-	-	-	-	14	13	-	-	-	-	-
6	-	32	-	16	39	-	-	-	-	-	-	-
7	-	-	11	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	25	-	-	-	-
11	-	-	-	-	-	-	15	-	-	-	-	-
12	-	15	-	16	-	-	-	-	-	-	-	-
13	16	-	24	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	17	19	-	-	-
17	-	-	-	-	-	-	13	-	-	-	-	-
18	-	10	-	13	23	-	-	-	-	-	-	-
19	7	-	14	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	9	-	-	-	-
23	-	-	-	-	-	29	14	-	-	-	-	-
24	-	14	-	20	18	-	-	-	-	-	-	-
25	10	-	33	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	14	-	-	-
28	-	-	-	-	-	-	-	3	-	-	-	-
29	-	-	-	-	-	12	36	-	-	-	-	-
30	-	-	-	26	19	-	-	-	-	-	-	-
31	12	-	17	-	-	-	-	-	-	-	-	-
No.	5	4	6	5	4	3	5	5	2	0	0	0
Max	16	32	33	26	39	29	36	30	19	0	0	0
Avg	11	18	19	18	25	18	18	17	17	0	0	0

Min: 3 Max: 39 2nd Max: 36 # > 150: 0 Total Obs: 39

Arithmetic Mean: 18 Standard Deviation: 8

Envirocon, Inc. 01/07/93

* * * SUMMARY STATISTICS FOR PM10 PARTICULATE DATA * * *

Reporting Year: Last Quarter 1991, First 3 Quarters 1992

Livingston, MT, Envirocon Sampling Stations

					Arithmethic		Geometric			
Site	Min	Max	2nd Max	Number >150	Mean	Upper 95% CI	Mean	Upper 95% CI	95th Percentile	Total Number of Obs.
Upwind	5.0	36.0	33.0	0	18.4	20.3	17.1	19.0	32.0	55
Downwind	3.0	39.0	36.0	0	17.0	19.2	15.5	17.5	32.0	52

Envirocon, Inc. 01/06/93

Envirocon, Site #2 - Met **Livingston, MT** **July 1992**

****** WIND SPEED - MPH ******

	HOUR																							
DAY	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**AVG.**
1	6	7	5	3	2	2	2	3	9	10	4	6	8	11	15	16	15	14	13	12	11	10	9	8	8
2	8	5	6	5	2	1	2	2	3	4	5	7	6	8	4	7	4	7	7	6	4	5	8	9	5
3	9	11	15	13	17	9	4	4	3	4	4	6	10	12	8	19	22	9	5	3	10	10	2	4	9
4	5	5	4	4	5	7	4	8	11	3	5	5	4												5
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30																									
31																									
AVG.	7	7	8	6	7	5	3	4	7	5	5	6	7	10	9	14	14	10	8	7	8	8	6	7	

Valid Hrs: 85 Completeness: 17.1 %

Envirocon, Inc. 01/06/93

Envirocon, Site #2 - Met **Livingston, MT** **July 1992**

****** WIND DIRECTION ******

	HOUR																							
DAY	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**AVG.**
1	249	249	12	53	163	156	278	193	355	1	4	340	343	47	75	72	69	74	65	62	60	57	49	35	128
2	49	20	350	336	359	55	13	14	12	221	194	71	53	165	186	179	141	17	11	352	209	216	244	228	154
3	227	237	239	218	207	213	326	64	358	339	325	205	248	289	276	199	201	210	41	155	232	265	203	31	221
4	102	31	52	316	81	13	15	188	216	129	289	85	25												119
5																									
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30																									
31																									
AVG.	157	134	163	231	203	109	158	115	235	173	203	175	167	167	179	150	137	100	39	190	167	179	165	98	

Valid Hrs: 85 Completeness: 17.1 %

Envirocon, Inc. 12/11/92

Envirocon, Site #2 - Met **Livingston, MT** **September 1992**

*** * * * *WIND DIRECTION* * * * ***

HOUR

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG.
1																									
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13																									
14																									
15																									
16	26	38	10	53	345	183	250	55											13	210	92	54	37	14	70
17	285	284	269	283	255	248	252	272	261	345	6	359	356	360	2	1	268	271	260	264	272	269	243	272	181
18	191	236	219	235	23	20	259	252	248	229	229	227	211	243	268	261	4	360	359	355	16	326	25	48	222
19	250	249	251	250	236	250	249	249	247	224	218	209	209	247	263	262	262	252	258	264	232	248	248	254	224
20	279	269	261	234	249	278	251	253	270	275	271	274	259	263	266	275	271	266	262	264	263	250	247	272	248
21	245	248	238	255	261	65	25	22	323	224	209	210	242	257	268	282	249	257	256	259	255	256	225	234	259
22	236	234	206	226	244	271	245	252	234	207	210	218	215	214	205	253	298	264	244	234	223	198	35	229	212
23	212	238	264	244	229	229	226	246	238	215	205	199	205	251	271	265	241	203	347	9	256	248	233	217	226
24	211	210	213	218	221	223	221	216	213	212	229	231	234	284	277	250	256	243	257	267	218	257	245	248	239
25	256	235	255	219	232	248	239	240	249	238	235	252	253	257	262	220	263	269	265	269	267	248	235	235	238
26	244	261	263	269	234	242	273	256	220	210	212	246	219	210	210	218	249	261	229	211	234	249	256	239	242
27	206	265	197	248	256	341	350	336	184	225	216	111	81	38	100	46	214	221	215	218	216	203	200	202	228
28	205	220	352	28	32	252	254	247	212	203	202	216	216	224	203	109	258	252	56	47	12	57	0	246	172
29	224	246	232	225	219	201	198	206	214	228	196	209	210	215	205	254	252	265	263	265	210	54	226	233	206
30	29	15	37	37	263	216	210	207	205	203	205	212	192	202	202	215	284	271	224	213	217	229	66	47	210
AVG.	207	217	218	202	220	218	233	221	237	231	203	227	222	218	214	208	225	199	231	209	200	88	20	38	161
																	240	257	234	222	199	202	159	189	

Valid Hrs: 359 Completeness: 49.8 %

Envirocon, Inc. 01/06/93

Envirocon, Site #2 - Met **Livingston, MT** **July 1992**

****** WIND SIGMA (DEGREES) ******

	HOUR																							
DAY	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**AVG.**
1	21	25	32	12	69	63	42	56	13	18	66	35	19	38	11	11	13	12	14	11	11	11	13	13	26
2	15	20	16	10	13	35	65	56	53	56	42	79	31	37	85	24	63	23	16	31	43	44	46	16	38
3	24	22	17	16	12	58	59	54	80	41	55	66	41	18	24	26	13	45	74	58	52	55	50	61	43
4	59	35	45	63	49	30	48	41	23	76	61	87	57												52
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30																									
31																									
AVG.	30	26	28	25	36	47	54	52	42	48	56	67	37	31	40	20	30	27	35	33	35	37	36	30	

Valid Hrs: 85 Completeness: 17.1 %

Envirocon, Inc. 01/06/93

Envirocon, Site #2 - Met **Livingston, MT** **September 1992**

****** WIND SIGMA (DEGREES) ******

DAY	HOUR 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG.
1																									
2																									
3																									
4																									
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8																									
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10																									
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12																									
13																									
14																									
15																			49	36	23	19	26	12	27
16	27	37	11	46	70	37	57	35									11	10	10	8	9	22	22	10	25
17	8	8	13	18	23	11	37	20	15	34	27	19	16	15	14	14	16	20	11	12	68	44	13	38	21
18	71	21	10	67	68	32	38	17	13	12	15	19	16	28	12	11	10	10	9	28	19	8	8	7	23
19	7	7	8	9	14	13	9	13	14	16	11	11	18	23	12	11	11	11	9	7	14	19	16	16	12
20	17	29	19	21	21	9	27	15	9	9	10	15	14	14	14	15	15	10	13	12	10	9	19	8	15
21	9	12	9	8	19	70	34	22	89	19	12	19	31	21	15	14	16	26	10	29	16	54	77	54	28
22	16	26	41	18	42	45	40	53	52	11	16	13	15	16	21	51	62	47	47	73	25	17	18	15	32
23	15	15	10	15	11	17	25	22	25	13	13	13	14	22	13	11	21	28	15	15	21	20	17	24	17
24	12	12	12	12	11	11	12	13	13	12	17	17	22	10	9	40	18	16	37	20	24	19	22	18	17
25	15	20	23	14	20	15	16	13	15	17	20	13	14	18	20	20	48	21	18	11	16	10	13	11	18
26	21	11	9	21	18	29	28	15	17	11	14	20	17	15	14	15	13	16	14	12	12	13	14	12	16
27	61	57	24	21	17	48	16	26	61	28	71	43	45	25	40	35	77	41	46	23	53	34	67	27	41
28	11	17	59	38	41	27	11	15	18	20	15	13	18	18	24	64	26	12	34	79	34	69	42	13	30
29	11	43	54	14	17	17	13	14	15	21	11	14	14	17	32	32	21	11	52	23	16	61	34	24	24
30	32	16	26	26	84	11	12	11	11	10	18	19	20	16	14	17	21	22	56	17	44	68	27	29	26
AVG.	22	22	22	23	32	26	25	20	26	17	19	18	20	17	18	25	26	20	27	25	25	30	27	20	

Valid Hrs: 359 Completeness: 49.9 %

Envirocon, Inc. 01/06/93

Envirocon, Site #2 - Met **Livingston, MT** **July 1992**

****** TEMPERATURE - DEG C ******

DAY	HOUR 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG.
1	10.1	10.0	9.2	9.0	9.0	9.0	9.3	9.7	9.5	10.8	13.0	13.2	12.5	11.7	10.7	10.9	10.9	10.3	9.3	8.3	8.3	8.3	8.1	7.9	10.0
2	7.6	7.4	7.3	7.6	7.6	7.8	8.7	9.9	10.9	13.1	14.1	14.4	14.8	15.8	17.3	17.3	17.6	16.2	15.3	13.0	12.3	11.9	11.7	11.6	12.1
3	10.9	11.1	11.9	12.2	12.1	12.2	13.0	14.3	15.4	16.6	19.1	20.7	21.4	21.7	21.6	17.9	15.8	16.4	15.5	13.8	14.5	14.5	12.9	13.0	15.4
4	12.5	10.2	9.6	10.7	11.7	10.1	12.5	14.1	14.1	16.8	19.3	21.1	22.0												14.2
5																									
6																									
7																									
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26																									
27																									
28																									
29																									
30																									
31																									
AVG.	10.3	9.7	9.5	9.9	10.1	9.8	10.9	12.0	12.5	14.3	16.4	17.4	17.7	16.4	16.5	15.4	14.8	14.3	13.4	11.7	11.7	11.6	10.9	10.8	

Valid Hrs: 85 Completeness: 17.1 %
Minimum: 7.2 Maximum: 23.4 Mean: 2.5

Envirocon, Inc. 01/06/93

Envirocon, Site #2 - Met **Livingston, MT** **September 1992**

****** TEMPERATURE - DEG C ******

	HOUR																							
DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG.
1																									
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									
13																									
14																									
15																			23.7	22.9	16.7	14.6	13.4	12.1	17.2
16	10.8	9.9	9.1	8.7	8.0	7.7	7.9	7.2									24.5	24.4	23.8	21.8	21.6	19.8	16.5	18.1	15.0
17	17.5	16.2	14.5	15.4	14.0	14.8	15.5	16.7	16.8	14.0	12.2	10.9	8.6	7.7	8.2	9.2	10.3	11.0	9.8	7.3	6.9	5.8	4.0	2.9	11.3
18	1.2	0.7	0.1	-0.5	-1.6	-1.9	0.4	1.8	3.2	6.2	8.7	11.7	14.6	17.8	19.1	19.8	20.8	20.8	19.9	17.9	15.6	14.6	14.0	13.1	9.9
19	11.9	11.3	11.0	11.4	13.0	10.7	10.4	9.3	12.1	15.3	17.1	19.2	21.7	23.2	23.1	22.9	22.8	22.8	22.1	19.6	18.8	18.1	18.1	16.8	16.8
20	16.6	15.4	14.5	13.1	13.8	14.2	13.5	14.4	14.2	14.9	15.7	16.2	17.3	17.9	18.6	19.5	18.2	16.1	15.4	15.0	15.6	15.6	15.0	14.6	15.6
21	13.7	13.4	13.4	12.7	12.1	10.1	7.5	7.5	8.1	12.6	15.4	17.5	19.4	20.4	21.4	22.0	22.5	22.8	22.3	18.9	16.5	14.3	12.8	16.1	15.6
22	16.3	16.3	15.8	15.3	14.0	12.7	14.0	14.4	15.5	16.9	18.5	21.0	23.6	26.3	27.6	28.8	29.2	28.6	27.1	23.7	23.9	22.2	22.7	23.0	20.7
23	22.6	21.6	20.5	20.3	20.1	20.6	20.1	19.5	19.9	20.8	22.6	24.7	26.1	25.6	26.0	27.4	25.4	26.7	23.4	21.2	23.8	22.2	23.0	21.4	22.7
24	22.0	21.3	20.7	20.4	20.4	20.1	20.0	20.0	20.0	20.2	20.4	20.2	20.0	15.9	10.7	8.1	7.6	5.8	7.3	8.0	7.3	7.7	8.0	8.6	15.0
25	8.3	8.8	8.6	9.4	9.7	8.8	8.2	9.1	9.7	10.4	10.9	11.9	11.3	12.1	11.6	11.0	10.7	8.7	10.1	8.6	8.4	9.3	8.7	8.4	9.7
26	8.2	8.4	8.5	8.0	7.6	7.2	7.0	7.3	7.6	8.6	11.3	13.3	14.8	15.6	16.8	18.1	17.8	17.7	17.7	16.7	16.2	15.9	15.7	15.6	12.6
27	15.6	15.2	15.5	14.7	14.5	11.2	7.9	8.4	9.6	11.0	12.4	13.2	14.6	15.7	16.4	17.6	17.9	18.0	15.8	12.5	10.2	9.2	7.8	6.2	13.0
28	4.3	3.3	2.5	1.4	-0.1	4.2	5.1	5.8	8.5	10.4	13.2	16.0	19.0	21.5	23.3	25.0	24.6	24.8	22.7	18.0	14.8	12.3	16.7	17.6	13.1
29	17.2	16.1	15.5	16.0	15.3	14.5	14.4	14.4	14.3	15.1	16.8	19.3	22.7	25.1	27.0	27.3	27.7	27.5	25.2	20.3	17.0	14.5	11.4	9.5	18.5
30	7.8	6.7	5.5	5.2	10.8	15.5	15.9	15.6	15.7	16.2	17.5	20.2	23.0	25.7	27.7	29.2	30.0	30.1	27.0	21.2	17.4	15.1	12.8	11.4	17.6
AVG.	12.9	12.3	11.7	11.4	11.4	11.4	11.2	11.4	12.5	13.8	15.2	16.8	18.3	19.3	19.8	20.4	20.7	20.4	19.6	17.1	15.7	14.5	13.8	13.5	

Valid Hrs: 358 Completeness: 49.7 %
Minimum: -2.5 Maximum: 30.5 Mean: 8.1

Envirocon, Inc. 01/08/93

*** Wind Frequency Summary ***

Envirocon Station 2 - 1992

Wind Direction	Wind Speed - MPH 0.0 - 4.0	4.0 - 7.5	7.5 - 12.1	12.1 - 19.0	19.0 - 24.7	>24.7
N	1.7	1.0	0.4	0.2	0.0	0.0
NNE	1.9	1.0	0.3	0.0	0.0	0.0
NE	1.6	2.0	0.9	0.2	0.0	0.0
ENE	1.2	0.9	2.0	1.4	0.0	0.0
E	0.9	0.3	0.1	0.0	0.0	0.0
ESE	0.5	0.1	0.0	0.0	0.0	0.0
SE	0.3	0.0	0.0	0.0	0.0	0.0
SSE	0.3	0.1	0.0	0.0	0.0	0.0
S	1.4	0.2	0.1	0.2	0.1	0.4
SSW	2.2	1.1	2.9	6.2	4.4	2.0
SW	1.9	2.6	8.1	9.5	4.9	1.3
WSW	1.1	1.3	7.2	5.1	1.3	0.4
W	0.9	0.5	1.8	2.9	1.1	0.0
WNW	0.6	0.4	0.5	0.4	0.0	0.0
NW	0.4	0.3	0.1	0.0	0.0	0.0
NNW	1.0	0.5	0.4	0.1	0.1	0.0

Total Hours Recorded: 5010

APPENDIX B

QA/QC

CERTIFICATION OF DATA INTEGRITY

Bison Engineering Inc. certifies the data contained herein is an accurate summary of air quality and meteorological conditions measured at the Livingston Railyard in Livingston, Montana. Every effort was made to obtain accurate and representative data and to comply with procedures set forth in the Quality Assurance Handbook for Air Pollution Measurement Systems; Volume II, Ambient Air Specific Methods (EPA-600/4-77-027a) and the conditions of the Interim Remedial Measures Work Plan (work plan).

Project Manager: Julie L. Hall

Title: Staff Engineer

Date: December 9, 1992

ENVIROCON INC.
Livingston, Montana

PM10 Calibrations - Wedding & Assoc.

Calibrated by : Dan McCaffery
Location : Livingston BN Site Upwind
Sampler # : 0240901115U
Date : 9/15/92

Calibration Orifice #S48-ECO1: Q [m3/min] = .52419 [(dP)^.48042]
Last Certified : 6/12/92

LOOK-UP:

Sampler Manometer	19.5 inches water	= delta
Barometric Press.	25.35 inches mercury	= P0
Temperature	25 degrees celcius	
	298.2 degrees kelvin	
P1/P0	(P0 - [delta/13.6]) / P0	
	0.943	
Q (look-up) [acfm]	{[T[k]/248]^0.5} *	
	{[(P1/P0) * 84.5238] - 42.329}	
	41.03 [acfm] l-u	
Q (look-up) [scfm]	acfm * (P0*298) / (29.92*T[k])	
	34.74 [scfm] l-u	

REFERENCE TRANSFER ORIFICE STANDARD:

Orifice Manometer	: 4.2 = dP	
Qr [m3/min]r	: .52419 [(dP)^.48042]	
	: 1.045 [cmm]r	
Qr [cfm]r	: Qr [cmm]r * 35.314	
	: 36.89 [cfm]r	
Qr [scfm]	: Qr [cfm]r *	
	{(P0*298)/(29.92*T[k])}^0.5	
	: 33.94 [scfm]	
Qr [acfm]	Qr [scfm] *	
	{(T[k]*29.92)/(298*P0)}	
	40.09 [acfm]	

Q [scfm] % Difference = {(Q [scfm]lu - Qr [scfm]) / Qr [scfm]} * 100

= 2.3 %

ENVIROCON INC.
Livingston, Montana

PM10 Calibrations - Wedding & Assoc.

Calibrated by : Dan McCaffery
Location : Livingston BN Site Downwind (Met)
Sampler # : 0240901114U
Date : 9/15/92

Calibration Orifice #S48-ECO1: Q [m3/min] = .52419 [(dP)^.48042]
Last certified : 6/12/92

LOOK-UP:

Sampler Manometer	19.1 inches water	= delta
Barometric Press.	25.35 inches mercury	= P0
Temperature	25 degrees celcius	
	298.2 degrees kelvin	
P1/P0	(P0 - [delta/13.6]) / P0	
	0.945	
Q (look-up) [acfm]	{[T[k]/248]^0.5} *	
	{[(P1/P0) * 84.5238] - 42.329}	
	40.76 [acfm] l-u	
Q (look-up) [scfm]	acfm * (P0*298) / (29.92*T[k])	
	34.54 [scfm] l-u	

REFERENCE TRANSFER ORIFICE STANDARD:

Orifice Manometer	4.1 = dP
Qr [m3/min]r	.52419 [(dP)^.48042]
	1.032 [cmm]r
Qr [cfm]r	Qr [cmm]r * 35.314
	36.46 [cfm]r
Qr [scfm]	Qr [cfm]r *
	{(P0*298)/(29.92*T[k])}^0.5
	33.56 [scfm]
Qr [acfm]	Qr [scfm] *
	{(T[k]*29.92)/(298*P0)}
	39.64 [acfm]

Q [scfm] % Difference = {(Q [scfm]lu - Qr [scfm]) / Qr [scfm]} * 100
= 2.9 %

BISON ENGINEERING, INC.
Helena, MT

PM10 AUDITING

Audited by Cal Loomis Location Livingston, MT

Date Aug. 6, 1992 Sampler No. EV2

Field Use

Orifice I.D. Number E32 Temperature (°F) 92

10" Manometer 2.6" (" H_2O = dP) [Clean Filter] Barometric Pressure 25.33 (" Hg = P_o)

Clean Filter Transducer _____ (acfm)

Notes Winds about 15 mph

Look Up

P_1/P_o (from previous calibration) = 0.945

ACFM = 41.73

SCFM = $ACFM\left(\frac{P_o * 298}{29.92 * T_k}\right)$ 34.37

Orifice

$Q = A*(dP)^B$ = 0.9956 (m^3/min)

$Q_{cfm} = Q * 35.314$ = 35.16 (acfm)r

$Q_{scfm} = Q_{cfm}\left(\frac{P_o * 298}{29.92 * T_k}\right)^{0.5}$ 31.90 (scfm)

$Q_{acfm} = Q_{cfm}\left(\frac{P_o * 298}{29.92 * T_k}\right)^{-0.5}$ 38.75 (acfm)

% Difference 7.7 (from SCFM) % Difference -3.13 (from 40 ACFM)

Last EPA/State Calibration: Date July 7, 1992

A = 0.62473 B = 0.48776

Rev. 1/92

BISON ENGINEERING, INC.
Helena, MT

PM10 AUDITING

Audited by Cal Loomis Location Livingston, MT

Date Aug. 6, 1992 Sampler No. EV1

Field Use

Orifice I.D. Number E32 Temperature (°F) 85

10" Manometer 2.7" (" H_2O = dP) [Clean Filter] Barometric Pressure 25.33 (" Hg = P_o)

Clean Filter Transducer _____ (acfm)

Notes Winds about 20 mph

Look Up

P_1/P_o (from previous calibration) = 0.943

ACFM = 41.28

SCFM = $ACFM\left(\frac{P_o * 298}{29.92 * T_k}\right)$ 34.44

Orifice

Q = $A * (dP)^B$ = 1.01 (m^3/min)

Q_{cfm} = $Q * 35.314$ = 35.81 (acfm)r

Q_{scfm} = $Q_{cfm}\left(\frac{P_o * 298}{29.92 * T_k}\right)^{0.5}$ 32.70 (scfm)

Q_{acfm} = $Q_{cfm}\left(\frac{P_o * 298}{29.92 * T_k}\right)^{-0.5}$ 39.22 (acfm)

% Difference 5.3 (from SCFM) % Difference -1.95 (from 40 ACFM)

Last EPA/State Calibration: Date July 7, 1992

A = 0.62473 B = 0.48776

METEOROLOGICAL MONITORING SYSTEM
Climatronics EWS Audit

Performed by C. Loomis Location Envirocon, Livingston Railyard

Date 9-15-92 Serial No. _____

FIELD USE

East/West Theodolite Position	North/South Theodolite Position
Vertical Alignment of Wind Speed: (1)	Vertical Alignment of Wind Speed: ok
Vertical Alignment of Wind Direction:	Vertical Alignment of Wind Direction: ok
Cross Arm East/West: NA	Cross Arm Horizontal: N A
	Indicated North: _____ degrees

Temperature Check

NIST (NBS) Temperature:	23.8 °F
DAS Temperature:	23.8 °F
Strip Chart Temp:	NA °F

Wind Vane (Direction Comparison)			Wind Speed		
Approx. Direction	DAS	Strip Chart	Motor Speed	DAS	Strip Chart
0/360	(2) 46/363	NA	0	(1)	
90			(Sync. Motor) 18.2		
180	23/183	NA	(Sync. Motor) 9.1		
270					

Linearity Check

	0	30	60	90	120	150	180	210	240	270	300	330
DAS	(4)											

NOTES (1) Anamometer did not produce a signal. (2) Wind vane scale 0-46 ... changed program multiplier to achieve 0-363. (3) East/West unavailable due to sun location. Note cross arm is not set to either North/South or East West. (4) Linearity check does not apply to MetOne instrument.

Rev. 2/92

COLLOCATED PM10 AIR SAMPLER PRECISION ANALYSIS

Rosebud Energy Project

Third Quarter - 1992

Date	Reporting Sampler Conc. (ug/M^3)	Collocated Sampler Conc. (ug/M^3)	D(%)
07/05/92	15.8	16.0	1.2
07/11/92	6.4	6.2	3.2
07/17/92	16.3	15.7	3.8
07/23/92	34.5	33.7	2.3
07/29/92	5.5	7.4	29.2
08/04/92	9.3	8.9	4.4
08/10/92	39.1	39.3	0.5
08/16/92	13.6	12.8	6.1
09/03/92	6.3	6.5	3.1
09/09/92	9.5	9.7	2.1
09/15/92	10.1	10.2	1.0
09/21/92	10.1	11.1	9.4
09/27/92	5.3	5.5	3.7

$$D\% = \frac{(Y_i - X_i)}{\frac{(Y_i + X_i)}{2}} \times 100$$

No. Samples = 13

Average D ($\overline{D}$) = 5.38

Std. Dev. (SD) = 7.53

Probability Limits:

$$\overline{D} - 1.96\left(\frac{SD}{\sqrt{2}}\right) = -5.06$$

$$\overline{D} + 1.96\left(\frac{SD}{\sqrt{2}}\right) = 15.82$$